STWP REVIEW

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Articles should not exceed 2500 words plus three illustrations.

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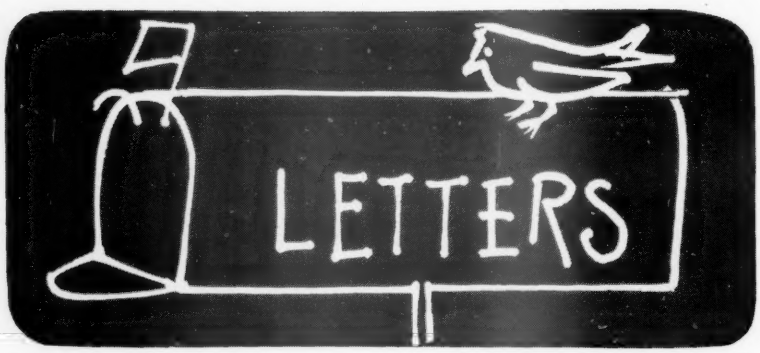


To Editor, *STWP Review:*

Army technical manuals prepared for the Corps of Engineers serve as "recipes" for equipment. Written in a style similar to the pretty little wife's cookbook, the technical manual shows the use of small words and short sentences and paragraphs. Instead of "Add 1 cup of molasses and stir until thin," the technical manual says "Remove the sediment bowl and clean it."

Much work goes into a technical manual before it is printed by the Government Printing Office and released by the Department of the Army to the operator of the equipment concerned or to maintenance personnel.

First, the number of the manual denotes specific items of information. For example, "TM 5-6115-246-10" on the cover of a manual reveals the following information:

TM — Technical Manual
5 — Corps of Engineers code number
6115 — Federal Stock Number for generator set
246 — Control number of the individual item of equipment
10 — Designates Operator's Manual

If the generator set is used by the U. S. Air Force, the manual will also carry the Technical Order number.

Second, the manual shows simplicity in the outline of its chapters and major parts. The following outline is for an Operator's Manual:

Table of Contents
Chapter 1. Introduction
2. Installation and Operating Instructions
3. Maintenance Instructions
4. Demolition of Material to Prevent Enemy Use
Appendix I. References
II. Basic Issue Items List
Index

To enable the operator or maintenance personnel to become acquainted with the equipment quickly, a summary of the safety precautions contained in the text of the manual is printed inside its front cover.

Most technical manuals are well illustrated. As many as 35 illustrations may appear in an Operator's Manual. Over 100 pictures may appear in an Organizational Maintenance or Field and Depot Maintenance Manual. A legend near the picture identifies the name of each part called out.

Tables are inserted where there are sufficient data and where the information is not repeated in the text.

Instructions for the preparation of Corps of Engineers technical manuals specify that the average length of sentences should be around 20 words. This rule does not mean that sentences should be so short that they are terse, monotonous, telegraphic, or obscure.

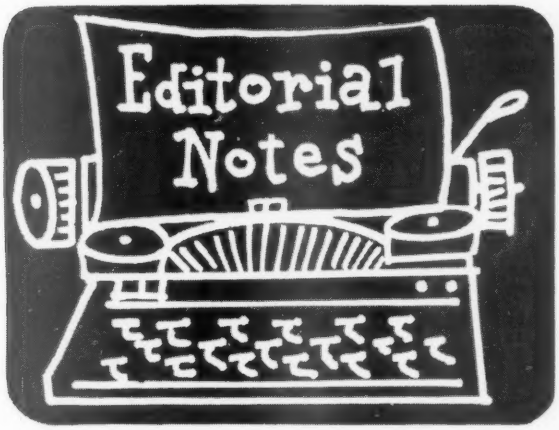
Use of the active voice is prevalent in the technical manual, as it is in the wife's cookbook. Instead of employing nouns, adjectives, and adverbs, the verb in the active voice is used. The following words are typical of those used in a technical manual:

Adjust	Inspect
Drain	Press
Fill	Rotate
Ground	Secure
Insert	Slide
Lift	Test
Loosen	Tighten
Lubricate	Turn

The instruction is always in the second person (*you* understood). This imperative mood or language of command is used wherever possible as the technical manual is intended to be directive in nature. The manual is written to sound like spoken communication. The following sentence is a sample: "Remove the plugs from the top and bottom of the secondary fuel filter and drain the filter."

Usage of the present indicative is reserved for descriptions or where instructions indicate standard practice. Use of gerunds and participles is avoided whereever possible.

(*Continued on page 34*)



This editorial note is concerned with the summer conferences for summer school sessions on technical writing. I have attended summer sessions at Syracuse University, Rensselaer Polytechnic Institute, and Colorado State University. Each one of these, of course, is different and each one has a slightly different purpose. There are other fine summer programs, but my personal experience has been limited to these.

Syracuse University has intensive summer school courses and at least one, Magazine Article Writing, provides a new viewpoint on technical writing for even those writers who have published their articles.

RPI has two Institutes, and this year an experiment in combining the annual Technical Writers' Institute with the Medical Writers' Institute through basic lectures on effective writing was successfully carried out under the direction of Dr. Jay R. Gould.

Academic instruction was provided both groups at the same time by the Rensselaer staff on these subjects: the process of communication, fundamentals of correctness, techniques of description, persuasive writing, and article writing. The Institutes then met separately for writing exercises designed for their specialities and to hear authoritative guest speakers.

The attendees represented industry, government departments, pharmaceutical houses, technical and medical magazines, and advertising firms. They presented a wide range of professional activities starting with report writing and proceeding through manuals, technical and medical publicity, literature searching, and supervision.

At Colorado State this summer Dr. Herman Weisman, Director of the Institute, had an equally comprehensive program, highlighted by Dr. Dan Q. Posin, who you will remember spoke so well at the Chicago convention of STWE and TPS. This CSU program covered reports, motion pictures, a discussion of the technical situation, writing about science and technology, medical journalism, the technical house organ, instruction books, administration of publication groups, government specifications, graphics including cartoons, and automated communication techniques.

As with most things, there are both advantages and disadvantages to the short summer session or institute. Perhaps the most outstanding good feature is that it gives technical writers, technical editors, and administrators a chance to compare notes. After talking with other people from other companies, you almost invariably feel better since they have the same problems and the only difference is that perhaps they call things by different names. A summer session always leaves me with the renewed faith in the fundamental vigor of our profession since I discover people in fields of related technical writing which are very different from my own on the surface but which have problems closely related to my own.

The inherent disadvantage to a summer session is that it is so short. There are always many more questions raised than can be resolved in the available time. Perhaps the best answer to this is careful planning which is in evidence both at the Technical Writers' Institute at RPI, and the Institute in Technical and Industrial Communications at Colorado State. A question period is useful in clearing obscure topics in a talk. It is almost always true that a participant in one of these summer sessions learns as much from the students during the social activities as he does from the lectures, but this is one of the purposes of such a session.

Technical writing groups throughout STWP should take a second look at summer institutes. They are a valuable means of broadening individual people and a good technique for expanding the field of interest of both supervisors and potential supervisors. Cross-fertilization of writing ideas and an understanding of new graphics techniques are just two of the products of a summer meeting.

If you have not had such an experience, plan one for next summer.

Allan Lytel

The Language of Science: Its Simplicity, Beauty, and Humor*

Anatol Rapoport

There are two widely held notions about the language of science: first, that the vocabulary of this language consists largely of words difficult to spell and pronounce; second, that it is an extremely prosaic language, a language of factual reports, one that excludes both sentiment and imagery. The anti-intellectuals, when they ridicule scientific vocabulary, often accuse the scientist of deliberately obscuring his language, either because of snobbism or exhibitionism.

The defenders of scientific terminology point out that the scientist must make distinctions that are of little consequence to the layman. For example, when the layman says "grouse," the ornithologist must say *Lagopus scoticus* or *Lyrurus tetrix* or *Bonasa umbellus,* because all of these grouse do not even belong to the same genus, and the distinctions are important to the ornithologist. Since there are hundreds of thousands of known species of animals and plants, the vocabulary of the naturalist must be immense.

Paul H. Oeser in "The Lion and the Lamb: An Essay on Science and Poetry" [*American Scientist,* XLIII, pp. 89-96 (1955)] offers the following dramatic example of contrast between prose and poetry. The prose is from Henry S. Canby's "Definitions: Second Series":

> Tail nearly as long as to slightly longer than wing, more or less rounded, flat (not vaulted), the retrices relatively broad, with broadly rounded tips. Tarsus less than one-fourth to about one-third as long as wing, the acrotarsium with a single row of large transverse scutella, the planta tarsi usually with a single row of small scutella along outer side and smaller, irregular scutella on inner side; lateral toe reaching to or slightly beyond . . ."

Contrasted with this is a stanza by Lew Sarett on the common loon *(Gavia immer)*:

> With mournful wail from dusk to dawn
> He gibbered at the taunting stars —
> A hermit-soul gone raving mad,
> And beating at his bars.

Again we recall the familiar attacks upon and the defenses of the language of science. The attackers point to scientific description as desiccative, as something that acts like a destroyer of spiritual meanings. I suppose these people find a similarity between the language of science and that perversion of the commercial mentality that is aware of the price of everything and of the value of nothing.

And, of course, there are the standard defenses. We must separate knowledge from sentiment. Recall that compassion may comfort the sick, but it will never cure them as prosaic medical knowledge will. In politics, sentiment leads to demagogy, while dispassionate analysis encourages statemanship, etc.

My concern is not with the issue of whether the often outlandish vocabulary and the graceless style of scientific writing is a good or a bad thing. Instead I maintain that in those areas of science where the richest and the most profound insights abound, just the reverse is true: (1) vocabularies are small and consist of short, commonly used words; and (2) the elements of poetry, such as symmetry of expression, figures of speech, and rich imagery, abound.

COMPLEX IDEAS STATED SIMPLY

Some key terms in the vocabulary of modern higher algebra are group, ring, field, ideal, trace, norm, normal, simple. The vocabulary of analysis (another of the main branches of mathematics) depends heavily on words like limit, function, converge, continuous, regular, analytic, pole. In topology we have different kinds of sets, e.g., open, closed, and perfect; different kinds of spaces, e.g., compact, ordered, and separable. A term of crucial importance in topology is neighborhood. Fundamental words in physics are force, mass, work, power, action, energy, field, charge, current, potential, flux, heat, pressure, temperature, nucleus, particle, orbit, spin.

Certainly none of these words appears to have been designed to impress or intimidate anyone. However,

*Condensed from an address delivered at a symposium, "The Structure of Science," at the Wistar Institute, Philadelphia, April 17, 1959, and copyrighted by *ETC., A Review of General Semantics,* vol. 16, page 34.

here is the rub. It is impossible to explain the meaning of a single one of the words in the mathematics list and of most of the words in the physics list to anyone who has not had years of certain kinds of experience.

Most of the terms in physics are defined not by classification but by mathematical operation. Mass is force divided by acceleration; power is work divided by time; action is energy multiplied by time, etc. To someone who thinks only in terms of classificatory logic, these definitions must seem strange. True, we tend to become used to them, exposed as many of us are to elementary engineering and to mass production (who has not heard of "man-hours"?). But just because we are becoming used to this sort of thinking we often fail to realize what a profound difference in semantics the operational language of exact science has brought about.

Think for a moment about acceleration. A car salesman tells you that the car he is selling can attain a speed of 60 miles per hour from dead start in 11 seconds. Its acceleration during this period is therefore 88 feet per second per 11 seconds, or 8 feet per second per second. Instead of using the awkward expression "per second per second," the physicist says "per second squared." In my school days I remember a bold and honest boy in the physics class who asked the teacher just what he meant by a "square second." The teacher's sarcastic reply indicated that he did not know.

It is, of course, foolish to try to evoke an "image" of a square second. But that is just the point. The literal-minded are inevitably stymied, because they insist on thinking in terms of visual images and cannot get rid of a feeling that what cannot be visually imagined is not quite real. I am not referring to the dullards and to those who sacrifice imagination on the altar of so-called hard-headed realism. I am referring to the best minds in classical Greece, the first honest-to-goodness mathematicians in the Western World. They could think mathematically, but almost exclusively in terms of visualized geometry. To them a "square" was a square, not the result of a mathematical operation. Therefore the cube of a quantity might still have made sense to them, because it could be represented as a real cube. But a fourth power would have appeared as unreal to the Greek geometer as the fourth dimension appears to the layman of today. Neither is translatable into a visual image.

Here, then, is the first tremendous conceptual innovation that we owe to the language of science. Science has freed the intellect from dependence on concrete visualizable conceptualizations — largely through introducing mathematical operation as a generator of concepts. It is this semantic device that makes a comparatively small vocabulary sufficient for physics. Indeed, the technical glossary of the physicist is quite small, and the majority of terms in it are borrowed from common usage. The vast complexity of the language of physics stems from the richness of mathematical manipulation, which makes the coinage of new and complicated terms largely unnecessary. One might say that truly scientific terms are to common language words as the letters of the alphabet are to ideograms. The letters are simpler, more abstract, and endowed with far greater potential for combinations.

POETRY IN THE LANGUAGE OF SCIENCE

I shall now argue against the other prevalent notion, namely, that the language of science is prosaic. Examples supporting this view, such as excerpts from handbooks and catalogs are well known. Examples to the contrary are hardly known at all. This is not surprising. If science has a language of its own, its poetry is also its own. This poetry speaks to the initiates, and like most poetry and indigenous humor, it does not lend itself well to translation. Nevertheless I will try, at the risk of sacrilege, to translate some instances of scientific poetry and of scientific humor.

Poetry, I suppose, is a mixture of music, imagery, and metaphor. I will begin by giving an example of scientific metaphor. First consider the notion of a spectrum as it is used in optics. Light, as is generally known, is pictured in physics as electromagnetic vibrations in a certain range of frequency. Monochromatic light consists of a single frequency, describable by a simple sine wave. Combinations of sine waves of different frequencies and amplitudes characterize the actual light of our experience. A beam of such light, passed through a prism, will decompose into the constituent monochromatic parts, i.e., into different pure colors. These colors (i.e., wavelengths) with their associated amplitudes make up the spectrum of the beam.

Mathematically speaking, the spectrum is a table in which each of the frequencies comprising a beam of light is associated with its amplitude. To the eye, a spectrum appears as a gradation of colors in space. For example, a rainbow is a spectrum. Here the contrast between the prose of scientific language and poetry is particularly crass, for the rainbow is usually held to be a poetic object; and its reduction to a table of numbers is conventionally viewed as a debasement of esthetic value. But please follow me further.

It can be shown mathematically that any periodic vibration is analyzable into constituent frequencies with associated amplitudes. Indeed, the frequencies of a strictly periodic process must all be whole number multiples of a single fundamental frequency. A musical tone is just such a process. Every musical tone, therefore, has a spectrum, perceived by the ear as the "quality" of the tone, which makes the difference between the tone of the oboe and that of a flute, or the difference between the violin tone of a beginner and that of a master. In every musical tone, the frequencies are simple multiples of a

single fundamental frequency. The spectra of such tones (called discrete spectra) are therefore particularly simple. A noise, however, is not a strictly periodic process and so cannot be broken up into a series of evenly spaced frequencies. The spectrum of a noise is a continuous one in which all the frequencies, not just the multiples of a fundamental, may be represented.

BASIS FOR "WHITE NOISE" METAPHOR

Now the spectrum of white light is also a continuous one, specifically one in which all the frequencies have the same amplitude. In view of all these analogies, one can justify the metaphor "white noise," i.e., a noise whose frequency spectrum contains all the frequencies with equal amplitudes.

But time-dependent processes are not confined to light and sound. Electric current or the motion of an object can also be expressed as mathematical functions. If the mathematical functions are periodic, the associated spectra are discrete; otherwise they are continuous. In particular, any process whose frequency spectrum has the same mathematical form as the spectrum of white light can be christened "white noise" — a term much used in modern communication engineering, a truly interdisciplinary metaphor whose parentage stems from optics and acoustics but whose general meaning now implies a precise mathematical definition of "chaos." It is chaos because it can be shown that a white noise process is one where it is most difficult to predict, on the basis of what has happened, what is going to happen next!

Now you may well ask why this example is offered as an illustration of poetry in the language of science. To answer this question, let us recall that the effectiveness of a metaphor is gauged by two things: by the degree of superficial diversity and the degree of inherent similarity of the things identified. If a metaphor is extremely far fetched but at the same time calls attention to a profound relatedness of two phenomena, it is a powerful metaphor. A poetic metaphor is supposed to impart insight — the insight of recognition. And one of the principal functions of poetry is to impart such insights, which poetry does largely through inspired uses of metaphor. I submit that the language of science also does this.

SCIENTIFIC METAPHOR ROOTED IN REALITY

Science, we see, has its own peculiar method of metaphor construction. Like the metaphors of poetry, those of science stem from insights. But these insights, unlike those of poetry, are rooted not in personal or cultural perceptions of relatedness but in the actual structure of the world to the extent that this structure reflects itself in the mathematical description of reality.

One more example of this sort is instructive, because the metaphor it gives rise to is so far-fetched as to seem humorous. Several years ago workers concerned with the statistical characteristics of verbal output discovered striking regularities in the relationship between the frequency with which words occur in large samples of verbal output and the number of different words associated with each frequency. Thus the words that are used with the greatest frequency like *the, of,* and *to* have the fewest representatives, while words which occur least frequently have the most representatives. To put it another way, of the words that occur frequently, there are few; of the words that occur rarely, there are many.

Benoit Mandelbrot showed that these statistical regularities in the frequency of words are just what one would expect to find if one assumed that the users of language used it in such a way as to convey the most "information" at a given fixed average "cost" per word. Here *information* is used in the technical sense of the communication engineer, and *cost* is analogous to the energy expended in encoding, producing, or decoding a word. It was also shown by workers concerned with the mathematical theory of information (particularly by Claude E. Shannon and Norbert Wiener) that the communication engineer's measure of information is mathematically analogous to what is known as entropy in thermodynamics. The statistics of verbal output approaching its equilibrium (in the evolution of language) then becomes entirely analogous to the statistical behavior of a physical system, say a gas, approaching its equilibrium. There too, the greatest possible entropy (analogous to information) is attained under the restraint of constant total energy (or average energy per molecule), i.e., the temperature of the gas. The mathematical isomorphism of the two mathematical theories being complete, it becomes possible to identify a parameter in the formula describing the frequency distribution of the words in a given sample with the parameter describing the temperature of a gas which has reached equilibrium. Indeed, Mandelbrot makes just such a metaphorical identification. He speaks of the "temperature" of a language sample. It turns out that one of the "hottest" examples of English prose is Joyce's *Ulysses,* while the language of children or schizophrenics turns out to be characteristically "cool"!

I think these examples match some of the wierdest identifications to be found in poetry, and I suppose they serve a somewhat similar purpose. They are forms of play, but in the case of the mathematical metaphor, they are strictly disciplined play.

ORDINARY METAPHORS ADD COLOR

Nor does the language of science lack ordinary metaphors, whose function is simply to add to the vividness of discourse. In mathematics one finds an osculating curve, one which has very close-fitting contact with

another. (To osculate, of course, means to kiss.) One finds in mathematics also pathological functions, i.e., relations among variables with bizarre paradoxial properties. The language of American electronic technology is full of slang with its feedbacks, dashpots, choppers, and pip-trappers. The engineer has also introduced the black box, the hidden inner arrangement of a system which must be inferred by observing the relations between the inputs and the outputs. The psychologist has enthusiastically embraced this term, for it fits his own methodological problem. He observes the stimuli and the responses of an organism; what happens between them is shut in a black box, the organism's nervous system.

Threshold is a common term in neurophysiology. It has become so common that we forget its metaphorical origin. The physicist speaks of a degenerative gas, a metaphor borrowed from the mathematical metaphor degenerative curve, a curve characterized by a special value of a parameter which reduces it to a more primitive curve. The word primitive is, of course, also a metaphor, related to a hierarchy of complexity in mathematical expression. The biologist speaks of mutation pressure and of selection pressure, which are not pressures at all in the literal physical sense but which produce effects analogous to those of pressure, and of an adaptation landscape, over whose hills and valleys a population can be said to wander as its genetic makeup undergoes evolutionary changes. Pay-off, whose origin is possibly rooted in underworld jargon, is today a key term in the highly sophisticated mathematical theory of games.

As we pass to psychiatry, the metaphors of its technical discourse become, as is well known, so profuse that one wonders whether this language has not already crossed the boundary between science and poetry.

MATHEMATICAL SYMMETRY OF THEORETICAL PHYSICS

It is most difficult to speak of those esthetic qualities of the language of science that are most directly related to direct perception of beauty, difficult in the same sense as it is for a European to explain to a non-European wherein lies the haunting charm of a Schubert song. Some of the grandest generalizations of theoretical physics appear remarkably symmetrical when expressed in mathematical equations. For example, Hamilton's magnificent summary of the entire scope of Newtonian mechanics looks like this:

$$\frac{\delta H}{\delta q_j} = \dot{p}_j \qquad \frac{\delta H}{\delta p_j} = -\dot{q}_j$$

As with the "easy" words of advanced mathematics, it is useless to explain the meaning of the symbols. Just to understand H requires thorough familiarity with advanced theoretical physics. Therefore nothing is gained by identifying the p_j with the momentum of the jth particle of a system, the q_j with a generalized spatial coordinate, and the dot as a symbol of differentiation with respect to time. The words in the definition are equally meaningless to one not at home in the language of physics. However, an empathetic attitude may lead one at least to a faint understanding of the sort of feeling that a scientist might have in contemplating the almost perfectly symmetrical arrangement of the symbols on the page ("almost" because of the minus sign, which appears in the second equation only), while he ponders the fact that the knowledge accumulated over 24 centuries is concentrated in those symbols. Perhaps the Chinese philosopher, contemplating the exquisite calligraphic expression of an ancient aphorism on the printed page experiences a similar emotion. Ω

About the Author . . .

ANATOL RAPOPORT *is editor of* General Systems *and associate editor of* ETC., a Review of General Semantics *and the* Bulletin of Mathematical Biophysics. *He has been a staff member of the Mental Health Research Institute since 1955.*

Born in Russia, Dr. Rapoport attended Chicago public schools for seven years before studying music at the State Academy in Vienna from 1929 to 1934. He was a concert pianist between 1933 and 1937, playing in Europe and America. After attending the University of Chicago from 1937 to 1941 he received his doctorate in mathematics. He then served as an officer in the U.S. Air Force from 1942 to 1946. For the next seven years he was a member of the Committee in Mathematical Biology at the University of Chicago. He was a Fellow at the Center for Advanced Study in the Behavioral Sciences from 1954 to 1955.

He is the author of Fights, Games, and Debates, *recently published by the University of Michigan Press;* Operational Philosophy, *Harpers, 1953; and* Science and the Goals of Men, *Harpers, 1950.*

Techniques of Gathering Technical Information

Harry Baum

There's a famous recipe for rabbit stew that begins, "First, catch your rabbit." The first principle of writing a technical book or article isn't too different: "First, gather your information." The first principle of information gathering is "Make sure you know what information you want." The best way to do this is to be sure that you have a detailed outline before you start. It's analogous to marking your route on a road map before you start your trip.

PERSONAL INTERVIEW

Let's assume that you know what information you need. Chances are that you also know where you're going to look for this information. Perhaps you need research reports; maybe you're getting your information from manufacturers' drawings or from the actual equipment you're writing about. You may even have manufacturers' literature from which you can extract most of the information you need. But no matter what sources you use, the chances are that you'll find gaps in the information or that you'll come to parts of the text that are not clear to you. When this happens you have to go to a *person* to get the answer. The person you go to may be one of the experts in your own organization, or you may have to consult the client's experts. And when I say experts, I mean anyone from production line men through to top management. Getting information from written materials is merely a matter of knowing how to read, whether it's text matter or blueprints, and I'm going to assume that you know how to read fairly well or you wouldn't be interested in technical writing. Getting information from people is a different story. Assuming that the person you're talking to has the information you want, the problem of getting it from him is something like the problem Ali Baba had when he wanted to open the door to the thieves' cave. You have to know the magic words, and the chances are that they're quite a bit more complicated than "Open, Sesame." What's more, even if you want the same information from several people, you'll probably have to use different magic words for each of them.

Let's assume that you want to get some information from Mr. Joe Doakes. The first thing you have to do is to convince him that you're worth talking to. His time is valuable and he won't bother with you if he feels it's a waste of time. Your first job is to convince him that it won't be — that he has something to gain by talking to you.

WHAT WILL HE GET OUT OF IT?

There are three basic approaches to prove to Joe Doakes that the time he spends talking to you will be well spent. The approach you use will depend upon the man you're dealing with. The first method is the business approach. You're writing a book about a product manufactured by the company that Joe Doakes works for. It doesn't matter whether the book is a sales promotion piece, an engineering handbook, or a service manual. If Mr. Doakes is honestly interested in the company, he'll want to be sure that the book serves a purpose and that the information contained in it is accurate. The first thing you have to convince him of, then, is that there really is a good reason for writing the book. This may not be easy, but you have to try. You must know the purpose of the book and the audience for whom it's being written, as well as several cogent reasons for expecting the book to be able to serve its purpose with its intended audience. If you can convince your man, it's clear sailing from there on in. If you can't convince him, you're still not lost. *Don't argue with him too long.* Switch your approach and agree with him on one or two minor points; you can probably convince him that there is at least some slight possibility that the book will be useful. After that you point out to him that the book *is* going to be written, either because his company management wants it or because the Government demands it. The next thing to do is to point out to him that unless the book is accurate, it will be worse than useless, and that to ensure the accuracy of the the book, you need the information that he has.

The professional approach is the one to use when Joe Doakes is a scientist or engineer in a research laboratory. This fellow is probably not quite as interested in the company he's working for as he is in advancing the state of knowledge in his field of interest. Convince him that he will be doing this and you're all set.

The next approach you can use will probably work with either of the Joe's we've spoken about. It's the ego approach. *You'll print his name in the book.* This one is especially useful with the research man. His reputation is built upon the professional papers he publishes. Every time his name appears in print, his professional standing rises another degree. But make sure you actually *can* print his name in the book before you offer to. All too often, this is not possible. If you tell him his name will appear and it doesn't, all the excuses in the world won't help. The next time you need information from him, you'll have a really tough time getting it.

WHY SHOULD HE TELL IT TO YOU?

Now that you've convinced your man that he has something to gain by releasing the information, the next thing you have to prove to him is that *you're* the man to release it to. To do this, you have to convince him (1) that you're technically competent to understand him and (2) that you're a nice guy.

You can win half the battle on the first point without saying a word. If you're a member of the IRE or the SAE or any of the other professional societies, *wear your society pin.* Your man can then immediately recognize you as a professional. Unfortunately, you can't conduct an interview without talking, and Joe Doakes can easily become disenchanted after your first sentence. So make sure that you really *do* know your subject. Study it before you try to interview him, and make sure that the questions you ask are well thought out. The best way to do this is to write them down and memorize them before the interview. Even if you can't prepare in advance all of the questions you'll need, have several ready to start the interview and to keep it moving if it begins to lag.

Now that you've convinced him that you're technically competent, how can you convince him that you're a nice guy? The answer to that one is easy. Convince him that *he's* a nice guy, that in his field he's at least a minor genius, that you're really enjoying talking to him, and that you're getting a tremendous amount of valuable information. Whatever you do, don't ever give him the impression that you think you know more than he does. Giving Joe Doakes the impression that you're a know-it-all spells sudden death to the interview.

WHAT ABOUT THE CHARACTERS YOU'LL MEET?

Once you've convinced your man that he has something to gain by telling his story to you, the rest is clear sailing for most of the people you'll meet. There are, however, many people that will give you plenty of trouble during the actual interview. It's impossible, of course, to cover every situation you'll meet, but I've found six types that will cover a good many of them.

First, there's the fellow that loves to talk about his subject. He isn't too much of a problem. This is the fellow you go to with a question like "How do you get the clevis pin into the gonagus plate?" He will go into a dissertation on the Rockwell hardness of the pin, the tolerances of the hole in the plate, the trouble they had in getting the proper surface finish, ad infinitum. (At least it *seems* to be ad infinitum.) The important thing to remember with this fellow is that he will eventually get around to answering your question and, in the meantime, he'll give you a lot of background information that may be valuable to you. Have patience. It may take a little longer, but you will get the answers.

The next fellow is a little more difficult. He's the fellow that just loves to talk. He'll drift off into a discussion of anything — anything, that is, except the topic you're interested in. This fellow can be handled without too much trouble. You listen to him while he discusses his aunt Minnie's appendectomy, and when he's finished, you counter by launching into a dissertation on modern surgical techniques. Keep going for about two minutes and then catch yourself up short and say, "Oh my gosh, there I go again. Here I've come to find out how the integrating circuit works, and I'm taking up your valuable time with a discussion of surgery. I do this every time I have someone as stimulating as you to talk to." With this little gambit, you throw the blame for his vice upon your own shoulders. You're still a nice guy because you're so concerned with his time, but you have indirectly pointed out to him that the interview is taking too long.

THE DEEP THINKER

The third type is the fellow who thinks for five minutes between each word. This fellow is afraid to talk, but probably won't admit it, even to himself. He conceives of himself as an extremely analytical and deep-thinking person. There's very little you can do with him. One approach you can try is suggesting a couple of alternative answers to your questions after you've asked them. But even this might throw him off the track and do more harm than good. One thing you definitely do not want to do with this fellow is to seem impatient. Talk slowly when you ask your questions and, if possible, ask each question twice by phrasing it slightly differently the second time. If you're good, you may succeed in making him comfortable enough so that he can think a bit faster.

The next kind of Joe Doakes you may meet seems at first glance to be a close relative to the previous one. He's the fellow who's afraid that everything he says

will be held against him. At least, this is what he says. Actually, this fellow is probably more belligerent than scared. He probably thinks that either you or he (more likely you) will make mistakes during the interview, that the mistakes will appear in the manuscript, that his bosses won't have sense enough to look at the manuscript until the book is printed, and that they will then go through it with a fine-toothed comb, find at least a thousand errors, and blame them all on him. You approach him this way: "Mr. Doakes, I know just what you're talking about. I've seen that sort of thing happen before and the results can be very unpleasant for everyone concerned. Most of the time, of course, it's the publisher that makes the mistakes, but it really doesn't matter very much who makes them; once the book is printed, it's too late. That's why we have such an elaborate system of quality control. Every manuscript is carefully reviewed by our own technical staff after editing to make certain that we haven't introduced any errors. And then as a final precaution, the manuscript is always submitted to the client before the book is printed. In this case, Mr. Jones of your organization is going to review the complete manuscript. Of course, the material in your field is more difficult than most of it and, if you can spare the time, I'd certainly appreciate your looking at it before we send it to Jones."

THE ANTICIPATORY TYPE

The fifth type is the one who knows what question you're going to ask before you ask it. This fellow's real trouble is that he is too enchanted with himself to bother listening to what you have to say. But he can be handled too.

You ask him the first question on your list: "How do you get the clevis pin into the hole in the gonagus plate?" You've barely finished asking and this fellow is telling you how to remove the pawl from the ratchet plate. *Don't* get annoyed and interrupt him. Let him finish what he has to say. Chances are, he's answering the sixth question on your list anyhow. Now, don't go back to the first question; go on to the second and third. Perhaps he'll actually hear these and answer them. Then go back to the first question you asked and phrase it slightly differently. The chances are he'll never recognize it because he wasn't really listening to it the first time. By going back and forth this way, you should be able to get all your questions answered without alienating your man.

The sixth and last character is one who can easily get you hopping mad if you're not on your guard. He's the fellow who's such an expert in his field that he's sure you won't be able to understand him. You come up to him and you say, "Professor von Doakes, I would like to interview you about your latest theory in advanced quantum mechanics."

Von Doakes looks at you imperiously and intones, "Young man, there are only five people in this country with a sufficient background to be able to comprehend the subtleties of my Theory of the Gelandersprung Energy Level Transformation, and I do not believe that you are among them."

THE INSECURE TYPE

Actually, it just so happens that you were sent on this interview because you are a student of quantum mechanics; you have read every paper that von Doakes ever presented, you never had a bit of trouble with any of them and, come to think of it, you don't really believe that his work is anywhere near as great as von Doakes claims it is. Your first impulse is to pull the great man back to earth by demonstrating your knowledge. But hold back a minute. Chances are that von Doakes is making all of this noise because he is afraid he isn't too great. If he were really great, and *confident* of his greatness, he'd probably try to explain his theory to you even if he knew that you couldn't tell the difference between a corpuscle and a wave. Flatter this fellow a little bit, and he'll probably end up doing your job for you. Try this approach: "Professor von Doakes, I have always been one of your great admirers. I remember your first great triumph in Vienna when you presented the paper on Atomische Sitzmarke. You were certainly great then and your reputation today is completely unassailable. You're quite right about the inability of most people in the field to understand your Gelandersprung theory. It is certainly beyond my modest ability. But, professor, many of your students and followers are most eager to read a simplified version of your theory so that they can appreciate at least the major points involved. Do you think you could write a short simplification of it for me? I realize how busy you must be, but you would be making a great contribution to your field."

After this approach, you'll probably be stuck for an hour or two while von Doakes tells you the story of his life and tries to convince you that you're really one of his more brilliant disciples. But you'll get your information.

CONCLUSION

There you have it: a nice neat little package into which is fitted just about anyone you'll ever meet. Now forget it. Chances are that you'll never meet any of these characters. Each man you interview will be a unique psychological complex. You'll have to play every one of them by ear, not by formula. The only thing you can really hope to get out of this article is some idea of the methods that have been useful for

coping with a few of the characteristics that people I have interviewed have had. But no matter whom you interview, the principles will be pretty much the same. Don't alienate your man. Don't get your neuroses involved with his. Once you get emotionally involved, you'll be too interested in yourself to be able to keep the man you're interviewing going along a favorable path. Ω

About the Author . . .

HARRY BAUM *organized his own technical publicity service, Harry Baum Associates, after extensive experience as project manager with McGraw-Hill's Technical Writing Service and as style editor of their Encyclopedia of Science and Technology. He has a degree in mechanical engineering, with graduate work in advertising and marketing, writing, nuclear reactor engineering, and industrial training. He has written articles for the general and business press and has experience in the automotive, electromechanical, and shipbuilding fields.*

Mr. Baum is a member of the Society of Technical Writers and Publishers and the Society of Automotive Engineers, and is an Associate of the American Society of Mechanical Engineers. He helped organize and was first president of the New York Chapter of STW. He served as a member of the STW Board of Directors in 1957 and was the STW chairman of the joint STWE-STW nominating committee following their merger.

The Professional Man and The Obligation of Authorship*

Merritt A. Williamson

Why should anyone bother to prepare a paper for publication? This question must have been repeated many times in many situations. Undoubtedly there have been many different answers given. In this article I propose to talk about this subject since I think it bears importantly on the role of the technical manager, whether he be in a university, a government, or an industrial laboratory.

It is probably a truism that most technically trained persons do not like to write and hence do not do it very well. This is not true for all good technical men, however. I have had persons on my staff who possessed a real skill in the use of written English. It is probably true that our technically trained college graduates of today have not been made to practice their writing either in the secondary schools or in college. This is one of the results of the teacher shortage and it is truly deplorable.

If writing is an agonizing experience, then one certainly will not voluntarily sit down and compose either prose or poetry for any occasion. Even the writing of social or business letters may produce so much mental anguish that vital work does not get done and promotions pass people by. What can be done about it?

First I want to make it very clear that I am not making a plea for any increase in the number of papers published just for the sake of having more papers to read. I strongly suspect that a large portion of the papers written could just as well be destroyed without impoverishing the world to any great extent. There is much recognized duplication of material from journal to journal, but it may not be serious if the circulation is quite different. Review papers are very helpful and welcome to many, while these same papers are denounced by others as contributing nothing.

I do want to make a plea, however, for more well-written easy-to-read papers and articles. I think that, if more people would write and submit papers, the caliber of our publications would improve to the benefit of all.

A MORAL OBLIGATION

I believe that there exists an inherent moral obligation on every technically trained man, whether scientist or engineer, to make the results of his work known to others in the same field. Scientists and engineers are definitely dedicated to the truth. The scientist makes no bones about it. He considers his science as a stern taskmaster. He can deceive himself but he cannot deceive his science. The engineer being closer to practical matters may not be quite so idealistic about it, but in "The Faith of the Engineer," a statement prepared by the Engineers' Council for Professional Development, appears this paragraph:

> Since the Age of Stone, human progress has been conditioned by the genius of my professional forebears. By them have been rendered usable to mankind Nature's vast resources of material and energy. By them have been vitalized and turned to practical account the principles of science and the revelations of technology. Except for this heritage of accumulated experience, my efforts would be feeble. I dedicate myself to the dissemination of engineering knowledge, and especially to the instruction of younger members of my profession in all its arts and traditions.

The scientist cannot escape his obligation to publish the truth as he sees it, nor can the engineer escape his obligation to hand down the accumulated knowledge of his profession. In fact, in the Canons of Ethics for Engineers, Section 1 (which appears under the heading of Professional Life) reads as follows:

> The engineer will cooperate in extending the effectiveness of the engineering profession by interchanging information and experience with other engineers and students and by contributing to the work of engineering societies, schools, and the scientific and engineering press.

For those engineers and scientists who work in education there is an added professional obligation as an educator. In a recent statement issued by the Committee on Professional Ethics of the Association of

*This article originally appeared in the December 1959 issue of *Research/Development* magazine.

American University Professors, it was stated that "the professor's primary responsibility is to his subject—to seek and to state the truth in that subject as he sees it." This double obligation may account for the fact that more papers are written and published by university personnel than by industry or government people. The true university has an atmosphere favorable to publication.

GOVERNMENT REQUIRES REPORTS

In government, extensive reports are written. The stewardship function of those that are responsible for the expenditures of public funds makes it mandatory that all work is put on the record. There are many excellent government reports. The Government Printing Office is the largest such establishment in the world, but its publications are usually anonymous. One never really knows who authored some of the works. Although the government does not discourage publication in technical journals, it does exercise a censorship function in the areas of science where national security may be concerned.

Most of us believe that there is too much restriction, but the trend is toward a more liberal attitude. When certain papers are released for publication, they have a footnote or remark that the contents are the opinions of the authors and are not necessarily representative of the Government's attitude. Of course there are exceptions. The Journal of the Bureau of Standards provides an excellent means of publication which has excellent standards.

In industry, company policies are extremely varied. Some of the bigger, more enlightened companies have a fairly liberal publication policy. No industry, however, which is spending money for research and development will make the results of such work immediately available to the world until such time as it has assurance of maximum patent protection. No company wants to publish anything that will give aid and comfort to a competitor. For this reason some highly important work does not get published in time to prevent wasteful duplication. In industry one also has to be constantly aware of the popular press and how reporters might distort the technical content. Publication becomes more difficult, but in my opinion it is rarely impossible.

PUBLISHING BECOMES OBLIGATION

To my mind the advancement of technical knowledge of the profession and the areas of science is a vital obligation. In the light of the Russian progress in science, engineering, and education, we should carefully review any policies, wherever they exist, which are hampering or preventing new knowledge from being made available to the world. This certainly constitutes a ball and chain around our legs in this proverbial race for technical superiority which is the real battleground at present for our two major opposing ideologies. I make a plea: Let's get unfettered! We must sacrifice some limited small gains for a minor group in favor of some significant gains for our economic system as a whole. We know this. Why don't we do more about it?

We now have two reasons for publication: (1) obligation to the profession and to science and (2) obligation to the society and the economic system of which we are a part. I would be naive if I thought that either of these would constitute the driving force for most individuals to review their discoveries and publish their contribution. We must talk about a third reason — the benefits that accrue to the individual.

Published papers are attached to a man and follow him wherever he may go. They cannot be taken away. They provide one tangible means of evaluating the individual. In the realm of technical papers, one can be sure that they have been reviewed by a critical board of editors. One can be assured that they will be read and criticized by the man's peers. If he stands up under this, it is a powerful help to his technical reputation.

PUBLISHING ENHANCES PRESTIGE

University staffs are constantly being entreated and, in some cases, almost bludgeoned into publication. This is done to enhance the reputation of the university as well as to bring out the greatest potential of its individual staff members. There is extant a slogan in many places "Publish or Perish." I understand that in some of the Roman Catholic institutions it has been slightly modified to read "Publish or Parish."

As a faculty member in an administrative post I can certainly say that it is much easier to taik knowingly about the eminence of those faculty members who have published, since they are known throughout the country and the world for their contributions. It is much easier to justify rewarding them appropriately than rewarding those who perform an outstanding teaching function. Both abilities must, of course, be recognized and rewarded equitably, but that is another problem.

In government and in industry, as well as in universities, it is to the individual's credit that he is recognized for his contribution to a field of knowledge. To my mind, publication provides proof in no uncertain terms of the competence of an individual. Anyone who could publish and doesn't is missing a real opportunity to add to the recognition of his competence.

I have a feeling that persons do not force themselves to publish because of many reasons such as inertia, an antipathy toward writing, or a discouraging work environment. I believe, however, that there are many who do not know how to go about getting a paper published and still others who are unable to recognize the value of their own work.

In the case of the latter who feel that what they have to offer may not be a contribution, I would say that it

is not for you to decide. Why not prepare a paper and submit it to an appropriate journal and see what comes of it? I have had rejection slips from some of the best publications in this country! I would say keep trying. Widen your reading and you may find a journal which your contribution might fit. To those who do not know how to go about it, I would advise that you get a book from the library on how to prepare manuscripts, or write to some of the journals and ask the editor for instructions and information. This is not difficult but it does mean getting started.

SATISFACTION JUSTIFIES WORK

In summary, then, I am all in favor of publications. If you haven't published, why don't you get started today and dash off that article you have been thinking about, or why don't you encourage others to do it? The satisfaction that comes from this will more than outweigh any work which you might have to put into it. One word of caution, however; you must be prepared to revise your paper at least three times before submitting it, and you ought to get criticism on it from your associates before you submit it. If it is worth publication, it is worth putting in the best possible form so that its merit is recognized. Good luck! Ω

About the Author . . .

DR. MERRITT A. WILLIAMSON *is Dean of the College of Engineering and Architecture at Pennsylvania State College. He has had broad experience in research management as project officer for guided missiles for the Navy, Director of Technical Research for Solar Aircraft, and Manager of Burroughs Corporation's Research Division.*

Developing an Undergraduate Curriculum for Training Technical Writers and Editors*

Erwin R. Steinberg

My attitude toward minimum requirements for technical writers is based on a concept which at first glance may seem to be barely relevant to our topic: engineers and scientists should write their own reports. Acceptance of that statement means that in the broad spectrum of what we know as technical writing and editing, the most *technical* writing is not done by technical writers. Perhaps a seemingly irrelevant statement and a paradox are peculiar gambits with which to open a case. Yet I shan't attempt to explain or defend either. Some of you may not agree with me. But as technical writers and editors you need no one to rehearse the arguments for or against my point of view. You know them.

Let me move, then, to the converse of my premise. I have stated what a technical writer or editor should *not* be called upon to do. What *should* he or she be able to do? Basically, a technical writer's job is to translate scientific and technical information into a form in which it can be understood and used by someone who is not as highly specialized or educated in a particular field as the person or persons who developed or discovered that information. When I was in the Air Force, for example, we had what we called "tech orders," sets of instructions for the operation and maintenance of the various planes. The men who used tech orders were not engineers. Many of the pilots and most of the mechanics had not been to college. Manual writing of this kind, particularly for the government, is one of the major areas of technical writing.

AREAS OF TECHNICAL WRITING

Another major area is communicating scientific and technical information to nonspecialists within a company: to other employees, whether technical or nontechnical; and to management. Note that I said nonspecialist, not nontechnical personnel. Nonspecialist includes the nontechnical person as well as the technical person trained in another area. A chemist will need a different explanation of a newly designed solid-state d-c amplifier from the one written for an electrical engineer. And both will need different explanations from the one written for specialists doing research in that area. I should also remind you of my initial assumption: that communication between a scientist or engineer and his scientific or technical peers is not the responsibility of the technical writer. Reports of design or development work, or of research; conference papers; technical papers and articles — all of these should be written by the scientist or engineer who did the work being reported.

The third major area is communicating scientific and technical information to the public. Here again we run a wide gamut: from articles in the trade and semitechnical journals to newspaper stories and advertising.

Technical writers, then, need to know enough science to understand the major outlines and implications of a scientific or technical report. That means that they must be trained in the basic sciences: mathematics, physics, chemistry, and biology.

As professional writers, they should know their language and its resources, how to use it, and something of how it has been used in the past. That means training in composition, journalism, technical writing and editing, the nature and function of language, and literature. And they should have some skill in the artistic and mechanical means by which written language is recorded and presented: typing, layout and design, and the graphic arts processes.

As members of the industrial community who must work with all kinds of people and the various institutions of our society, they must also know some psychology, economics, and history.

*Presented at the Sixth Annual STWE Convention, Washington, November 17-18, 1958.

TRAINING FOR TECHNICAL EDITORS

The technical editor needs much the same training. He or she need not be a fully trained scientist or engineer to help a scientist or engineer prepare a report (notice I said "to help," not "to prepare" the report) or to make suggestions for its improvement after it has been written. Like the technical writer, the technical editor needs only enough science to understand the major outlines and implications of the material being presented.

The foregoing is based on my experience and the experience of half a dozen of my colleagues in the English Department at Carnegie Institute of Technology. We were all trained in the English language and literature. We wrote our theses on Chaucer, Shakespeare, Pope, Conrad, Hardy, and Joyce. For seven years we have been serving as communications consultants in industry. Among other tasks, we have helped scientists and engineers improve their writing of specifications, progress reports, technical reports, and even technical papers. Two of us have written a book designed for industrial and college courses in technical writing and editing. And our experience is not unique. I am not, of course, suggesting that technical writers and editors need training only in literature, but merely reporting that many people trained in literature serve successfully in those capacities.

I can also report that the kinds of writing I have outlined are often done poorly by scientists and engineers. Last summer as part of a survey of the communication problems of a major industrial concern, I interviewed over 70 scientists and engineers—half of them managers and supervisors, the other half younger men out of college from one to six years. The single problem referred to most frequently by these people was the difficulty the technical specialist has in writing for someone not a specialist in his area. Someone who is scientifically literate, but not as deeply immersed in either the

Table 1 — Requirements for Major in Technical Writing and Editing, Carnegie Institute of Technology

First Semester	Second Semester
FRESHMAN YEAR	
English Composition	English Composition
History of Western Civilization	History of Western Civilization
Chemisty I	Chemistry II
College Algebra or Analytic Geometry and Calculus I	Trigonometry or Analytic Geometry and Calculus II
Psychology of Adjustment	Elective
Physical Education	Physical Education
SOPHOMORE YEAR	
Introduction to Literature	Introduction to Literature
Bacteriology I	Biology II
Physics I	Physics II
Public Speaking	History of the U. S. and Pa.
Elective Typewriting	Elective
Elective	Physical Education
Physical Education	
JUNIOR YEAR	
Elementary Economics I	Elementary Economics II
Nature and Function of Language	Psychology of Industrial Behavior
Journalistic Writing	Journalistic Writing
Science Elective	Science Elective
Elective	English Elective
SENIOR YEAR	
Science Elective	Science Elective
Technical Research and Report Writing	Technical Research and Report Writing
Graphics Arts Processes	Layout and Design
English Elective	English Elective
Elective	Elective

subject matter or the specific project being reported, should not have that difficulty. A good middleman can often understand both the producer and the consumer better than the two can understand each other. A technical writer and editor is in an important sense a middleman.

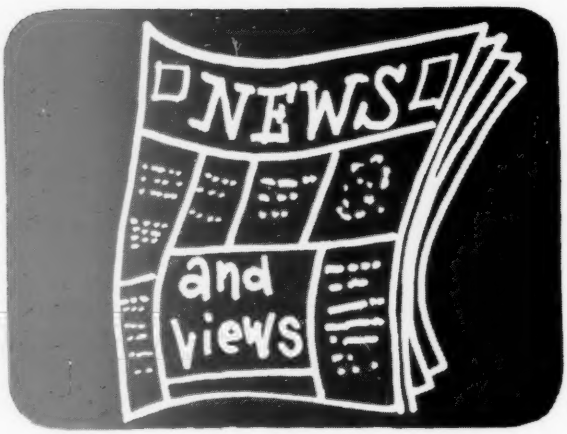
MAJOR IN TECHNICAL WRITING AND EDITING

I have outlined for you the thinking behind our new program for technical writers and editors at Margaret Morrison Carnegie College, the woman's division of Carnegie Institute of Technology. Essentially it is a combined basic science-English major supported by a few specialized courses. The students spend 30 percent of their time in mathematics and the basic sciences; 26 percent in the English language, literature, and writing; and 30 percent in the humanities, arts, and social sciences. In addition, they take courses in typing, layout and design, graphic arts processes, and technical research and report writing. They also serve a short internship in industry.

Table 1 shows the courses composing the curriculum for technical writing and editing majors at Carnegie. Ω

About the Author . . .

ERWIN R. STEINBERG *is head of the Department of General Studies in Margaret Morrison Carnegie College, Carnegie Institute of Technology, Pittsburgh. Since 1951 he has also served as communication consultant in industry and with various community organizations. He is coauthor of* Communication in Business and Industry, *which was published recently by Holt-Rinehart-Winston. He has contributed chapters to other books and has published articles in several journals and magazines. Dr. Steinberg was coproducer and moderator of a 15-week television series on the modern American novel. In 1956 he received the Carnegie Teaching Award. Dr. Steinberg holds offices in several professional organizations including the National Council of Teachers of English and the Pittsburgh Chapter of STWP, and is a member of STWP's national committee on education and professional development.*



By A. Stanley Higgins

mailed 10/10/60

NEW SYMBOL FOR STWP

We have a new name, but there is no emblem to represent STWP. A Symbol Design Committee was recently appointed by the Joint Interim Board of Directors to remedy this situation. Perhaps you have some ideas on the selection of a new symbol or maybe even a design that you'd like to submit. Your assistance is being sought by the committee. Contact Homer E. Shaw, Research Technical Publications (Dept. 50-15), Lockheed Missiles and Space Division, Sunnyvale, California. The deadline is October 15, so you'd better go ahead and do it now.

STWP MEMBER IS SERVO AUTHORITY

Henri Lauer, a former president of the Delaware Valley Chapter, is coauthor of *Servomechanism Fundamentals*, the Second Edition of which has now been published. A recent issue of *The RCA Family* contained the following article about Mr. Lauer:

> Henri Lauer is a name familiar to thousands of engineers. Not because he manages the Instruction Book section for Airborne Systems Division but because he is coauthor of a book on servomechanisms used by universities throughout the country.
>
> First printed in 1947, *Servomechanism Fundamentals*, became an authority for engineering students, and practicing engineer as well.
>
> Along with his coauthor, Leslie E. Matson, Systems Analysis Manager, Moorestown Plant, Lauer revised the book to reflect the latest developments in servomechanism theory and added a wealth of valuable design information. This second edition was brought out in March. The book will undoubtedly follow its predecessor in becoming a best seller among college textbooks and engineering reference books.
>
> Lauer became associated with RCA in 1942, but he has been an engineering author since World War I. He received a degree in mathematics from the University of Paris, France, and at one time was an assistant to Thomas A. Edison in development of military radio equipment.

INTER-SOCIETY EDUCATIONAL COUNCIL

From Meta Ellis, of the Sacramento Chapter, comes news of the formation in her area of an educational council similar to that described in a past issue of the *Review*. She states:

> The idea to form an Inter-Society Council came to us from the October 1959 issue of the *STWE Review*, the article by Mr. Frank R. Smith titled "A 'How to' for Education Committees." I couldn't sell the idea to the local STWP chapter, but the American Rocket Society bought it wholeheartedly. In Sacramento the ARS is probably the better organization to sponsor such a council anyway since it has 400 members, many of whom are members of other engineering societies and are active in these groups. Also, Aerojet is the largest industry in the community. Activities of the ARS are widely publicized.
>
> Enthusiasm for an Inter-Society Council is running high, and it should be functioning by fall. *The Sacramento Bee*, one of the two newspapers in the community, is following the activities closely.

HOW-TO DEPARTMENT

Many of us are involved from time to time with the headache of obtaining presentation charts that, although produced on a panic schedule, must be of the professional quality demanded by high-level audiences. N. E Doughty, Publications Supervisor at Aerojet in Downey, makes this contribution to our how-to department:

> Chart making is the bane of my existence. It would seem that group presentations are always finalized at the last minute, and approximately 20 to 40 charts will be required by the various speakers. With my company, this means full color, 20- by 30-inch art boards. How does one make professional-looking charts on a minimum time schedule?
>
> For better or worse, here is my answer. We have standardized chart sizes and headings. Thus there is no problem about general approach or "Where do I put the title . . . in what size letters," etc. Graph grids are marked off in ink and curves are plotted with either Chartape or Zip-a-tone solid colors. Mechanical lettering (ink) is used for all words on the chart *except* where there is a requirement for color, extra boldness, or a special font. For the exceptions, we purchase typeset on adhesive acetate and strip in the words. (If you intend to make color slides from a chart, watch the color-shift incurred by the acetate. The stripped area can stand out like a sore thumb.) Some charts require special art work, involving hours of creative effort, where no error is permissible. Here, we create the original art on paper, then trace onto the chart board. Thus only in the area of finishing touches is there room for error.
>
> There you have it. Hand-work on a chart is subject to human error — and erasures show the error. Mechanical aids and "transferred" art work permit the creation of crisp, clean charts with no work-over on the final product. And, curiously enough, since we have a system, fewer man-hours are involved to accomplish each job.

USE OF FIRST PERSON

In response to our discussion of the use of first person in the last issue, Ethaline Cortelyou, who is Chief Technical Editor at Aeroprojects in West Chester, Pennsylvania, sent along a reprint of an article she had published in *Chemical Engineering* in 1958. Her article, which she says was considered quite revolutionary at that time, points out the easier, more natural flow of technical exposition in the first person — the same way the scientist orally describes what he has done. She goes on to say, however, that since most research is a team effort, the first person plural is preferred to the singular.

(*Continued on page 32*)

Technical Prose Concreteness and Density

Ram D. Taneja and Walter P. Mayfield

Some speakers and writers regularly repeat ideas, using concrete examples and familiar illustrations. Others simply use different words in order to emphasize what they are saying or to make sure they are understood. Still others, rejecting both these methods, try to write or speak as concisely as possible.

So far very little experimental work seems to have been done to test the relation of "density" (conciseness) and "concreteness" (illustrations, examples, sensory words) to effectiveness of communication. William Freedman, of Rensselaer Polytechnic Institute, reported *(STWE Review,* July 1958) one study indicating that a paper may be condensed without affecting the transfer of essential information. Freedman found, however, that increasing the density slows reading speed and tends to antagonize the audience. In his study he did not distinguish between writing which is diffuse and concrete, and writing which is diffuse and abstract.

In our study, we set out to make this distinction and to determine the relation of density and concreteness to comprehension. This study, like Mr. Freedman's, was conducted under the direction of Dr. Sterling P. Olmsted as part of the Graduate Program in Technical Writing at Rensselaer.

EXPERIMENTAL MATERIAL

Two topics were selected for the experiment ("Communication Media" and "Space-Time") and were written up in similar form. The first versions of each topic were short (about half a page), theoretical, and concisely worded. We called these the *dense-abstract* versions (DA). We also prepared two other versions of each: a *redundant* or "filler" version (F) containing the same information in about twice as many words, but still theoretical and abstract; and a *concrete* version (C), about the same length as F but containing, in addition to the basic information, illustrations, examples, and applications. Slides were prepared for each version, and a ten-point quiz was constructed on each topic, the questions being based on information contained in all three versions of each.

PROCEDURE

Three experiments were carried out, using these materials in both oral and written forms, but the procedures or records on two of these were faulty or incomplete. We shall therefore report here on only one experiment in which we used three sections of freshmen (about 18 students in each section).

The dense-abstract version of "Communication Media" was given to all three sections as a control text, and each section was tested on it. One of the three freshman sections was then given the dense-abstract version of "Space-Time," a second section was given the concrete version of "Space-Time," and the third section read the redundant version of "Space-Time." Students read the texts from slides which were projected on a screen long enough to permit any student to read the text through at least once. The students were not timed individually, nor were they prevented from rereading the text.

RESULTS

The test pattern and mean scores are shown in Figure 1. The critical ratios between the means for each

	Control	*Experimental*
GROUP 1	DA Mean 7.15	DA Mean 7.04
GROUP 2	DA Mean 6.47	C Mean 8.05
GROUP 3	DA Mean 7.16	F Mean 6.95

Figure 1 — Mean Scores

group are given in Figure 2. Critical ratios indicate the probability that differences in scores reflect the operation of something other than chance. It is customary to say that a critical ratio of 3.00 or better indicates a significant difference.

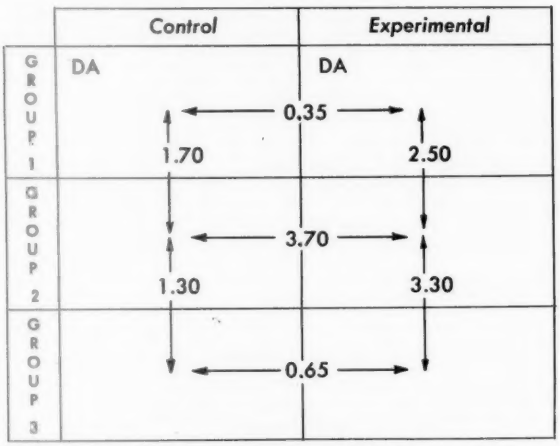


Figure 2 — Critical Ratios

On this basis, it appears there was no significant difference between the scores for the dense-abstract version (DA) and the redundant version (F). There was, however, a significant difference between scores for dense-abstract *and* redundant versions and the concrete version (C). Group 2 scored 6.47 on the DA version of "Communication Media" and 8.05 on the C version of "Space-Time." This concrete version of "Space-Time" may also be compared with the DA version of "Space-Time," with a mean score of 7.04; and the redundant (F) version, with a mean score of 6.95. The concrete version is significantly better than the F version, and somewhat better than the DA version, although the critical ratio is only 2.50.

CONCLUSIONS AND COMMENTS

We do not, of course, regard these results as definite. Too few students were involved, the text was too short, and the test contained too few items. The test should be repeated, both with these materials and with other materials as well. As far as we have gone the indications are:

1. That redundancy (padding with extra words which do not make a text more concrete) has no significant effect on reader comprehension.

2. That the addition of more concrete materials, illustrations, examples, etc., has a significant effect upon reader comprehension.

It would be desirable to try the experiment again, this time allowing each student to read the text once at his own rate, and recording all reading times as well as scores. The effectiveness of the three styles might then be measured in terms of two factors: comprehension and time. Experiments of this kind take time, and there is no guarantee that they will yield practical results; they do, however, give us a better understanding of the communication process. In the long run, they may even provide some measure of guidance to the practicing technical writer. Ω

About the Authors . . .

RAM D. TANEJA, *a graduate in chemical technology from Delhi (India), is Assistant Editor of* Research and Industry, *a monthly publication of the Council of Scientific and Industrial Research (Government of India), New Delhi. He visited the United States under a program sponsored by the International Cooperation Administration, Washington, to study American methods of communicating research information. He enrolled in the graduate curriculum in technical writing at Rensselaer Polytechnic Institute, Troy, New York, and received the Master of Science degree in June 1959. He has since returned to India to resume his position on* Research and Industry.

WALTER P. MAYFIELD *received his undergraduate degree in biology from the University of Alabama. After two year in the Army, during which he served as a technical editor at a research and development post in the Washington area, he entered Rensselaer Polytechnic Institute. There he received the Master of Science degree in technical writing in June 1959. He is now on the publications staff of the Shawinigan Resins Corporation, Springfield, Massachusetts.*

Documentary Control Aspects in Report Writing

J. Heston Heald

The Armed Services Technical Information Agency (ASTIA) is the scientific information center of the Department of Defense. As such, it must promote the most efficient use of its raw product, the technical report. The reports are received from the many military research and development programs at the rate of almost 30,000 new titles per year. They are cataloged, abstracted, subject-analyzed, and announced. During the course of a year, ASTIA will provide almost 500,000 copies of reports from its holdings to individual activities. It will supply bibliographic references involving many thousands more. In addition to this, it has been estimated that the annual primary distribution for new titles *apart* from ASTIA's efforts amounts to another 6,000,000 copies. All this emphasizes the importance of care in the writing, editing, and preparation of technical reports and the use of standardized documentation techniques.

Although it is generally recognized that the text, or body, is the most important part of the technical report, it is by no means the only important part. In fact, dissemination of the information in a report depends heavily upon accompanying bibliographic information such as the title; the author or authors; the corporate author; contract and project identification (numbers); dates covered by the report; date of the report; any local number assigned to the report; proper classification markings (when required); and, above all, an abstract. These are integral parts of the report and, as simple as they seem, they are often inadequate or forgotten entirely.

CATALOGING AT THE SOURCE

Realizing the value of these bibliographic tools and the importance of consistency in their preparation, ASTIA recently prepared a pamphlet entitled *ASTIA Guidelines for Cataloging and Abstracting.** It sets forth, quite specifically, the abstracting and cataloging rules followed by ASTIA. It is not the purpose here to go into these details, but rather to emphasize the profitable use of these guidelines by technical writers, authors, and editors of research and development technical reports.

Not long ago, one Department of Defense office determined that a single report, distributed two years earlier, had been cataloged 72 times and abstracted 11 times. Only 100 copies had been distributed. It carried no abstract, and no catalog cards were distributed with it; hence most of this effort was undoubtedly *necessary* duplication. Much of it could have been avoided, however, if a sheet of 3- by 5-inch abstract catalog cards, as described in the *Guidelines,* had been provided as a part of the report itself. (It should be added here that many activities are now following these *Guidelines* with productive results.)

Of course, ASTIA is one of the first to profit from this "cataloging-at-source" practice. But as ASTIA profits, so do its users. An acceptable abstract and complete cataloging information accompanying the report save ASTIA the cost of such preparation. In addition, the report may be announced in the *Technical Abstract Bulletin* (TAB) and made available to the user at an earlier date. Moreover, other libraries that might have to catalog and abstract the report are saved the task, the time and expense. Another gain is in the generally accepted fact that an author abstract is often better than one prepared by someone who is unfamiliar with the work.

The Air Research and Development Command, USAF, requires its various Centers to prepare and insert catalog cards in each research and development report. These cards are prepared in the ASTIA style as described in the *Guidelines.* Several Army and Navy activities are also doing this. Unfortunately, however, very few contractors to the Department of Defense follow this pattern in preparing their reports.

*Available from ASTIA upon request.

REFERENCING CLASSIFIED REPORTS

It is important to be able to make reference to classified reports in an unclassified manner. Generally, unclassified titles can and should be prepared. Writing an unclassified abstract for a classified report is more difficult, but it is important to do so whenever possible, even to the extent of including an unclassified version in addition to the regular abstract. Titles and abstracts containing no classified information should be plainly marked unclassified. This is required by security regulations and may be done by putting a parenthetical notation (U) after the title or abstract.

The unclassified titles and abstracts facilitate dissemination without compromising classified information. The classified reports themselves must remain under security controls. Their transmission is necessarily slowed because of this, yet they very often contain the more important information. This retarded movement of the actual report may be partially offset by cataloging the unclassified information. ASTIA uses only unclassified information in preparing announcements for TAB, thus keeping TAB, as a whole, unclassified.

IMPROVING PRODUCTION TECHNIQUES

Finally, those of us in ASTIA feel the importance of good production techniques in the preparation of reports. ASTIA has often been criticized for supplying poor copy. This is generally the result of trying to reproduce a report that is hardly legible in the first instance. ASTIA is taking steps to do what it can to improve the quality of its reproductions: (1) 35 mm film is replacing 16 mm; (2) care in photography is being exercised; and (3) an inspection system to pinpoint reproduction problem areas is being installed. All this can do very little, however, for the document that is illegible when it arrives.

CONCLUSION

In summary, ASTIA strongly encourages (1) the preparation of abstracts and catalog information at the source of a report and the inclusion of this information on 3- by 5-inch catalog cards as an integral part of the report; (2) preparation of unclassified titles and abstracts wherever possible and so marked in the document; and (3) production of reproducible copies. Ω

About the Author . . .

J. HESTON HEALD *is Chief of the Document Processing Division, Armed Services Technical Information Agency (ASTIA). He received his B.S. Degree from the University of Oklahoma. As a Naval officer during World War II he served as Head of the Physics Department at the Naval Academy Prep School. From 1945-46 he was on the staff of the Office of Naval Research, in charge of its scientific information activities. In 1947 he established the former Navy Research Section of the Library of Congress, directing its reference functions until 1952. Returning to ONR in 1952, he served as coordinator of scientific information and Navy-ASTIA Liaison Officer until assuming his present position in 1958.*

Mr. Heald is a Commander, USNR (inactive status); Member Special Libraries Association, Sci-Tech and Military Librarians Divisions; Vice President and President-Elect, Washington Chapter; Member, American Association for the Advancement of Science; and a Member, Board of Directors, National Federation of Science Abstracting and Indexing Services.

The English Major as a Technical Writer

Judith E. Deaver

A technical editor further professionalizes scientific publications. He corrects grammatical and punctuational errors, eliminates ambiguities, and establishes consistencies. He is required to edit only from a language standpoint; engineers and technical writers edit for technical accuracy. Technical publications that he may edit include proposals and brochures; engineering reports and instruction books; and operation, maintenance, and equipment description handbooks.

AN OUTLANDER IN ROME

An English major, lover of the pun, the malapropism, and the innovations of contemporary writers, joins the technical writing field. *Technical Editor* is his classification. His scientific background is meager; his psychological outlook is aesthetic. He immediately finds that technical writers can be all kinds of hostile to technical editors, especially English majors (and this is not to say some haven't good reasons). He also finds that in order to gain cooperation and to continue to perform his duties, he must be an incorporate purist/modern grammarian (i. e., much diplomat). His greatest asset is his flexibility in style and usage preferences, combined with a professional honesty.

The English major cringes at such functional shifts as "to normal-through." He is at a loss as to the hyphenation of noun-adjective pileups such as "a connector terminal answer supervision lead." He wears out his thesaurus in search of a synonym for "to ruggedize." After lengthy, and sometimes futile, arguments with the writers, the English major finally realizes that technical writing is not literature, and that engineering advances have produced a jargon that he has never encountered.

OUTLANDER ACCLIMATES

What does he do? The English major reads departmental procedures and military/commercial specifications. He learns standard abbreviations and proofreader's marks approved by his company. He reads books and articles pertaining to his technical field in order to acquaint himself with acceptable jargon. He visits the engineering laboratories, inconspicuously. He obtains reports and manuals previously published by his department and becomes familiar with the style of each writer. He learns everyone's name and always says "Good mor..ing" with a smile.

"Redmarking," or "bleeding," the copy of others is minimized during his first weeks of studying technical writing. But he keeps a card file. This serves a twofold purpose: (1) he has references for future operations and (2) he lets off steam without treading on the toes of the writers. The file is divided into several sections that cover grammar and punctuation, usage, proofreader's marks, abbreviations, and unclassified gripes. He extracts examples from poor writing; he waives or adds proofreader's marks in accordance with their adaptability and usefulness. He lists unauthorized abbreviations and replaces inadequate jargon with definitive terms. He shows his file to no one.

He studies in the library, writing justification for the notes on his cards. He grits his teeth and lets writers be wrong. He always says "Good afternoon" with a smile. After a time, the English major becomes an established technical editor. The writers realize that he is somewhat human, and the engineers appreciate his interest in their equipment.

OUTLANDER NO MORE

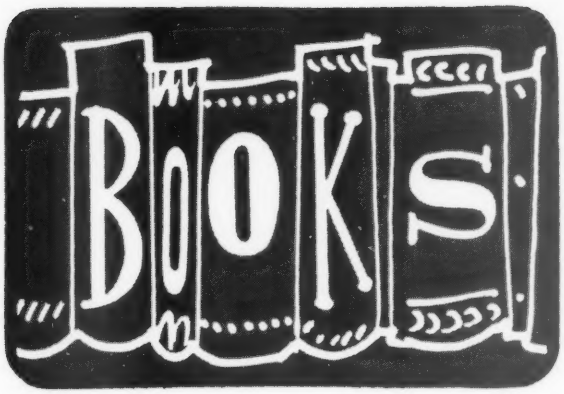
One of the main phases of the technical editor's job, however, has yet to be accomplished. He must produce a guide that will publicize editorial consistencies; his card file contains more than enough material necessary for the job. By this time he knows what of traditionalism the writers will accept and what of traditionalism he

must concede. He also finds that he was mistaken in many instances and should throw away about half of his file (saving himself embarrassment from his previous ignorance).

After his writer's aid has been published, he is by no means in a comfortable position. He never will be. He always keeps his file up-to-date and always finds new points of language to be settled with the writers. But he has accomplished much. He does not bleed manuscripts to individual oblivion, interfering with the writers' styles. The consistency he has established is that of grammar, usage, and form. The English major has actually become a "technical grammarian," holding a place somewhere between the purist and the liberal. Above all, he has learned that his job is to edit, not to rewrite. Ω

About the Author . . .

JUDITH E. DEAVER *is a technical editor and reporter for the Publications Department, Texas Division of Collins Radio Company, located in Richardson, Texas. She received her Bachelor of Arts degree in English from North Texas State College, where she tutored literature and Freshman English. Her present position requires editing all company publications and writing the Texas Division Newsletter, monthly engineering reports, and special projects.*



TECHNICAL COMMUNICATION. George C. Harwell. 332 pages. New York: MacMillan Company (1960). $5.00.

There must be a good market for books on technical writing, judging from the constant procession of new volumes on this subject. And one sometimes wonders, when he picks up another handsomely jacketed offering, just what kind of rearrangement of the old material will be found.

Certainly George Harwell's new book contains much information that appears, in a different form, in other books. His approach and style, however, set his work quite apart from others in the same area. By use of a simple, logical, and well-organized method, he has added something new to the literature of technical writing.

Although *Technical Communication* was written as a textbook, it should find good use by the practicing engineer. It was not intended for experienced technical writers, but many in our profession — and especially newcomers to the field — would gain much from this book.

The main purpose of Dr. Harwell's work is to show what good writing is, and he achieves this purpose not only by his treatment of the subject but also by his own clear, concise writing.

His approach is also worthy of note. After dealing with the qualities of good writing, organization of material, and the use of exposition in Chapters 1 to 3, he takes up the business letter in Chapter 4. The student is allowed to gain experience in writing in a form that he is most accustomed to, and this facilitates the book's later discussion of more and more complicated technical reports.

Succeeding chapters are titled Reports: General Matters; Reports: Formal; Reports: Informal; Technical Articles; Oral Communication; and Illustrative Material. A valuable part of the volume is the Manual of General Composition, which is appended. This section contains simple explanations of points of grammar, style, and composition mechanics that even experienced technical writers could find helpful.

To the student and practicing engineer Dr. Harwell's book brings a fresh, uncomplicated approach in a subject area that they often consider the most formidable part of their activity.

A. Stanley Higgins

ATOMS, MOLECULES, AND CHEMICAL CHANGE. Ernest Grunwald and Russell H. Johnsen. 252 pages. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. (1960). $6.00.

This book might well be used by practicing technical writers as a model of their craft. It is a clear, concise discussion of some important fundamentals of chemistry. The theme, the structure of matter and the chemical consequences of structure, is developed in a partly historical and partly logical manner. The historical aspects lend interest thoughout and instill an appreciation of the way in which chemical knowledge develops. The logic aspect is clear from a consideration of any part or all of the Contents page, e.g., Chapter 3 starts by making clear the nature of chemical change, deals then in order with the elements, compounds and mixtures, solutions, chemical changes contrasted with physical changes, and closes with a discussion of how to cause chemical changes. The concepts are pointed up by numerous well-chosen examples. The illustrations are good.

The unifying theme becomes more dominant as the book progresses through Chapter 6, The Kinetic Molecular Theory of Matter, and Chapters 8 and 9, The Structure of Atoms, Failure of the Daltonian Atom and Bohr's Theory of the Hydrogen Atom. Succeeding chapters develop a stepwise understanding of the structure of atoms with more than one electron, ionic compounds, covalent compounds, the atomic nucleus, and related subjects. The final chapter, a fitting climax, is devoted to nuclear reactions and energy.

The book is intended primarily for nonscience students at university level. The originality of concept and approach are wholly commendable. In addition, it will be found absorbing reading by anyone who has observed or read about the chemical phenomena of our day and wants further understanding of the underlying principles.

I. H. Jenks

CLASS D CITIZEN'S RADIO. Leo G. Sands. 181 pages. New York: Ziff-Davis (1960). $4.95.

All that this reviewer can say is that Leo Sands has done it again. Readers will remember that Leo Sands wrote a fine article on free-lance writing in the January 1960 *STWE Review* and, in the same issue, there was a review of two of his earlier books.

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This time Leo, an STWP member, has written about the exciting uses of "poor-man's" radiotelephone, Citizen's Radio Service (CRS). There are four classes of CRS. Class D is covered in this new book.

Class A uses commercial FM two-way radio gear, built for operation in industrial, land transportation, or public safety services in this highest-grade Citizen's service.

Class B equipment is a superregenerative UHF transceiver, considerably simpler than Class A equipment. Power output is much less than for Class A, but still adequate for short-range mobile communications.

Class C is used for remote operation of garage doors, model aircraft, and boats. There are several types of simple radio systems available. These may use either an interrupted CW transmission or a nonmodulated (AM) signal for control purposes.

Class D is the new band which is responsible for the renewed interest in Citizen's radio. There are no restrictions on the use of Class D equipment except operation within the law. The band is open for business or personal use, without guarantee of protection from interference.

Written for the informed layman, this book explains the why and how of CRS, and it will contribute to better use of this rapidly expanding field.

Allan Lytel

DO THEY UNDERSTAND YOU? Wesley Wiksell. 193 pages. New York: MacMillan Company (1960). $4.95.

This is a primer of basic, person-to-person communications, stressing the employer-employee level. Extracting the meat of useful information from the stew of phraseology has long been a problem facing technical writers. Here is a book that shows you not only how to present your case clearly to others, but also how to listen intelligently.

The author is Professor of Speech at Louisiana State University. A nationally known lecturer on oral communications and a consultant to industry, he is currently President of the National Society for the Study of Communication.

Technical editors and supervisors constantly face the problem of imparting accurate production information to others and of understanding clearly and interpreting correctly the desires of management. Limited talking and listening abilities could, therefore, constitute a serious handicap.

The urgency of improved verbal communications might be better understood when it is realized that, according to the author, the efficiency of such communications is only 30 percent, with the balance being either distorted, misunderstood, rejected, or forgotten.

Going beyond the realm of mere conversation, the author stresses the valuable psychology of being

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Bruce Lewis

RECOMMENDATIONS OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. 18 pages. New York: Pergamon Press (1959). $0.50.

This relatively short book covers exactly what its title implies. It is made up of recommendations of a Commission on the subject of radiological protection. It is impressive to see the list of people making up this commission (ICRP). They come from various parts of the free world and each is a leader in his field.

This book serves to open our eyes to the really horrible effects of radiation. It is factual but leaves no doubt that our government, together with others, is doing its best to collect the data and make the proper recommendations. The rest is up to us.

Claire Cox

THEORY OF INERTIAL GUIDANCE. Connie L. McClure, 334 pages. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. (1960). $12.00.

Mr. McClure, of IBM, has written a comprehensive text on guidance and navigation. Experts tell me it is correct and complete. But there has been no attempt to make it clear. On page 1 the author says, "Systematized reason would seem to indicate that, whatever be the ultimate truths and signficance of life and Man, relativistic and/or absolute, such discoveries must reflect a fundamental correlation between the nature of Man and the basic mechanisms of the universe. While current science may be less than completely satisfactory with respect to specific knowledge, it appears improbable that it can be grossly incorrect in some such unified point of view. Thoughts of this general character, relating the behavior and aspirations of Man to the cosmic environment, lead to speculation correlating the compulsion to exploration with the existing domain of mobility. That is, perhaps the desire to expand the accessible world stands in some proportion to the magnitude of the accessible world. Be that as it may, and irrespective of any appreciation which one may entertain for peripheral speculation of this nature, it is fundamental that the cosmic kinematical environment of the Earth is the point of departure for the theory of inertial guidance as applied both terrestrially and to any future domain of mobility which lies beyond the mantle."

This book is a sound scientific text and an example of foggy writing.

Allan Lytel

INTRODUCTION TO COLLEGE PHYSICS. Second Edition. Rogers D. Rusk. 944 pages. New York: Appleton-Century-Crofts, Inc. (1960). $8.00.

When a new textbook appears on the market, especially on physics, one quickly scans it for new material. There is new material in this book — solid state physics, electronics, nuclear physics, etc., and all of it is necessary to keep one up to date with present-day findings and theories.

Unfortunately we did not have a copy of the first edition, so comparison of changes and improvements could not be made. Some of the newer material was treated in great detail, while other parts of it were covered very sparingly. We can assume that either detailed information was not available or space limitations caused the curtailments.

Technical writers and editors might find this book a useful addition to their libraries for its explanations of basic principles which are so necessary to our understanding of the great technological developments appearing every day on our horizons.

Richard A. Hanousek

ELEMENTS OF GENERAL CHEMISTRY. Jay A. Young. 455 pages. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. (1960). $6.95.

Dr. Young has written an excellent, clear text which is "a practical introduction to the purposes, aims, and common sense of chemistry."

Jay A. Young is Chairman of the Chemistry Department, King's College, Wilkes-Barre, Pennsylvania. Dr. Young is an active member of the American Chemical Society and the American Association for the Advancement of Science. He has contributed numerous articles to journals sponsored by these societies, notably to the *Journal of Chemical Education*. The majority of these papers deal either directly or indirectly with the teaching of chemistry.

His book reflects careful thought in planning and presentation. Designed for a one-semester course, it presents a logical sequence of ideas. Problems, analogies, and the conversational tone of the book provide a good structure for an introductory text. The final chapter, Atomic Nucleus, is up to date but it is rather short.

As technical writers we can learn from Dr. Young's skill in presentation.

Allan Lytel

PETROLEUM ENGINEERING — DRILLING AND WELL COMPLETIONS. Carl Gatlin. 341 pages. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. (1960). $13.00.

This timely and useful text highlights the fundamental techniques for tapping an oil deposit for production.

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It should be very valuable to laymen, drillers, geologists, and petroleum engineers. The author's extensive use of excellent pictures, charts, and tables does much to simplify many complicated problems and concepts and makes it easy to read and understand the text.

Librarians will find the extensive index, references, and supplemental reading lists to be most helpful. Some of the chapters list 50 to 60 references. However, the literatureis so voluminous in all subjects covered that the author has had to be very selective. For example, he lists 43 references on drilling fluids, whereas a comprehensive bibliography would contain more than 5000 references.

The experts will take issue with some of the author's statements. For example, his comparison of rotary and cable tool drilling shows extremes that unduly favor the rotary. Also, his description of the use of the rubber sleeve core barrel misses the fundamental point that the barrel was designed to obtain otherwise unrecoverable cores for use in reservoir analysis and estimation of reserves. In the section on portable derricks, the widely used jack-knife derrick was not mentioned. This all adds up to the fact that the flood of information being poured out on most all the subjects covered in the book is so great that no one man can read and comprehend it all.

In final analysis, Dr. Gatlin has made a significant contribution to the literature on oil well drilling and completion. His compilation and organization of basic information in these fields provides an excellent study text and should save much time for those who wish to up-date their knowledge of equipment and procedures without getting too involved in the science behind them.

G. H. Cloud

PHYSICS: FOUNDATIONS AND FRONTIERS. George Gamow and John M. Cleveland. 539 pages. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. (1960). $7.95.

In the Preface the authors say, "In an introduction to physics at the college level, the authors feel that the physics of today should be strongly emphasized. Modern physics is the key to understanding the atom and the nucleus and the quantum, which play so large a part in our lives — even relativity is good newspaper copy. Behind these frontiers of science, however, the foundations laid down by Galileo and Faraday and others cannot be slighted. The laws of Newton are still vital in every satellite and rocket. We have tried to make both the foundations and the frontiers alive and interesting."

The authors have succeeded in making this a lively and entertaining physics text at an introductory college level. Included in the 33 chapters, which cover in a lucid fashion both classical and modern physics, are biophysics, astrophysics, geophysics, satellites, and of course a wealth of material on nuclear energy. Covering

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this wide range of topics makes it impossible to go very deeply into any one, but in an introductory text there is no need for this. The 300 illustrations add to the clarity of presentation. This is a well-written book.

Allan Lytel

NEWS AND VIEWS

(*Continued from page 18*)

It is interesting to read Mrs. Cortelyou's recommendations on contract research report writing. She avers:

> I consider it mandatory to use the first person and active voice in stating conclusions and recommendations for a sponsor even though the rest of a report may be written in the third person and in passive voice.
>
> I hope that I am not considered inconsistent when I say that I would like to see a return to the use of the first person in describing step-by-step all the procedures followed. I prefer to use the third person in describing procedures and reserve the first person for statements of opinions, conclusions, recommendations, and unique observations.
>
> Certainly background information and discussion of work of others should be written in the third person. Verifiable experimental observations also could be presented in the third person; however, it is more effective to use the first person in describing such observations as have not yet been verified by others.

MATHEMATICAL PSYCHO-LINGUISTICS

Are you familiar with mathematical psycho-linguistics? The following interesting article from the *Washington Evening Star,* March 30, 1960, was submitted by Ed Lacy, a member of the Washington Chapter:

> Nearly all youngsters — and most adults — know the Mother Goose rhyme about the house that Jack built.
>
> It's the one which somewhere in the middle goes: "This is the cow with the crumpled horn that tossed the dog that worried the cat that killed the rat that ate the malt that lay in the house that Jack built."
>
> Despite its length, and its many thoughts, this excerpt is easy to understand.
>
> The reason, a Harvard psychologist said last week, is that the construction is simple: consecutive clauses to express consecutive ideas.
>
> But just try the same thing another way, suggested Dr. George A. Miller:
>
> "The cat, worried by the dog tossed by the cow with the crumpled horn, killed the rat that ate the malt that lay in the house that Jack built."
>
> Dr. Miller is an authority in a new field of learning — so new, he admits, that it doesn't have a recognized name. He calls it mathematical psycho-linguistics.
>
> His chief concern — as he described it at a National Science Foundation colloquium last Wednesday—is with the why's and wherefores of the mind's ability to remember.
>
> He has discovered that, on the average, the mind can absorb quickly and readily seven "chunks" of information. The chunk might be one letter, or it might be a whole clause.
>
> What he wants to find out now is why the mind can remember chunks in one order better than in another. He thinks it's got something to do with the hierarchial structure put together by the brain for memory purposes, but he doesn't know how to pinpoint the connection.
>
> Dr. Miller told the scientists attending the colloquium that he is sure memory is related more closely to structure and order of the chunks than to their meaning.
>
> The meaning, he said, comes only after the structure is understood.
>
> "The time is ripe for a major breakthrough in this field," he claimed.
>
> Once someone finds out why the mind organizes words the way it does, it will become possible to find out a lot more about human behavior in general — what sort of structural patterns it has.

NEW ADVERTISING MANAGER

This is the first issue of the *STWP Review* with John Marple as Advertising Manager. John heads Business Publications in Exeter, New Hampshire. We hope that his broad experience in publications will round out our staff and lead to greater advertising sales in support of our journal.

ARTICLES AND SUGGESTIONS

Perhaps you noticed from the footnotes with several articles in this issue that our material has many sources. We reprint what we consider outstanding articles from other magazines. But to continue this program we need your support in locating other fine articles for possible use in the *STWP Review*. When you see an example of writing on subjects related to our profession clip it out and send it to your editor with a short note. There are as you know so many magazines which may carry articles of interest to our membership no small group such as the *STWP Review* staff can read them all. With your help we will discover, evaluate, and reprint more articles of wide interest.

We are always looking for new material written specifically for our journal. But we feel that this magazine should try to blend the best of both old and new to produce a magazine of significant value. Write to us with your comments and suggestions. Your journal's value to you depends upon your participation.

A Matter of Telepathy in Engineering Writing

The problem is not new — some of the most talented development and design engineers in electronics today think almost entirely in equations and block diagrams . . . at least when they're *on* the job.

And although an equation, like the proverbial picture, may be worth a thousand words to the eye of the beholder, there comes a time when the words *are* needed. Then what?

The day may come when we'll be able to strap a few electrodes to our engineer's scalp and pipe his mental images directly to the flying keys of an IBM typewriter readout . . . but for the present we're looking for that rare type of engineer/writer who will be infinitely more valuable than such a device.

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LETTERS

(Continued from Page 2)

The articles, *a, an,* and *the* are used sparingly to simplify and condense the text.

Even though the writing of a Corps of Engineers technical manual calls for simple words and short sentences and paragraphs, slang and jargon are avoided. Truthfully, the Corps of Engineers technical manual shows itself to be a prime example of a modern engineering adaptation of the housewife's recipe book.

Gerald A. Willey
Royer and Roger, Inc.
Columbus, Ohio

To Editor, *STWP Review:*

The April 1960 issue of *STWE Review* contained a lengthy letter attempting to clear up confusion over "Altitude, ft x 10^3" versus "Altitude, ft x 10^{-3}," but it is doubtful if that letter helped very much.

One way to end the controversy over use of powers of ten in abbreviating figure legends, column headings in tables, etc., is to think back to the classic way of expressing these in words, "Altitude in thousands of feet." Then, let "10^3" represent "thousands of," and we come out with: "Altitude, 10^3 ft." We have put the power of ten *in front* of the unit of measure, eliminated the times sign, and (we trust) eliminated the confusion.

Walter J. Miller
Albuquerque, New Mexico

To Editor, *STWP Review:*

I have read the letter by Barclay E. Tucker in the April 1960 issue of the *STWE Review*. Whereas I was a little confused when I started reading the letter, now I am totally confused!

Apparently, Mr. Tucker feels that either 10^x or 10^{-x} is correct depending upon the wording of the legend in which the term is used. Well, maybe the wording is critical so far as clarity of determination of absolute value is concerned. However, the basic issue at stake goes back to the definition of each term, and they are in no sense interchangeable.

In my opinion, "Altitude (ft. x 10^3)" means "thousands of feet" and "Altitude (ft. x 10^{-3})" means 'thousandths of *a foot.*"

Let's go back to the basic reason for using this technique for simplifying graphs and tables. The use of the factors 10^x and 10^{-x} is simply to avoid placing very large numbers on the scales of a graph or table.

Using the factor 10^x: To write 2000, 4000, . . . 20,000 it is only necessary to place the figures 2, 4, . . . 20 on the graph, then arrange the legend to apply the factor 10 with positive exponent according to the number of zeros needed to obtain the absolute value for the figures given — in this case it would be 10^3. In other words, each figure on the ordinate is multiplied by a factor of 1000.

Using the factor 10^{-x}: To write decimals, such as 0.002, 0.004, . . . , it is only necessary to place the figures 2, 4, . . . , then arrange the legend to apply the factor 10 with negative exponent according to the number of places needed to the right of the decimal point to obtain the absolute value — in this case it would be 10^{-3}. In other words, each figure on the ordinate is divided by a factor of 1000. . . .

The rule for positive exponents has been stated in this manner: When the exponent is a positive whole number, it shows how many times the base is to be taken as a factor. In the term a^n, a is called the base and n is called the exponent. For example,

$a = 10$
$n = 2$
$10^2 = 10$ taken twice as a factor
$(10 \times 10 = 100)$

Negative exponents may be defined as $a^{-n} = 1/a^n$. For example,

$$10^{-2} = \frac{1}{10^2} = \frac{1}{100}$$

I would take issue with some of the explanations of concrete examples presented by Mr. Tucker. A graph, page 39 of *Journal of Applied Mechanics,* with the legend "Strain, E x 10^6 (in./in.)" at a scale value of 2000 cannot be divided because the legend states that the scale value E (2000) is multiplied by the number 1 followed by 6 zeros (1,000,000) to obtain the absolute value for E. If he wants to express the absolute value of 0.004 then he should use a scale value of 4 and his legend should state "E x 10^{-3}." Substituting in the form given above for negative exponents with E = 4:

$$10^{-3} = \frac{1}{1000} = 0.001$$
$$\text{E x } 10^{-3} = 4 \times 0.001 = 0.004$$

Why use the factor 10^6 and a scale value of 2000? Why not use the factor 10^3 so that a scale value of 2 may be used — which is the basic reason for using a factor in the first place . . .

I cannot accept Jerry Kelly's statement that "either style may be used" because to me, each style has its place according to what absolute values the scale values represent. If you wish to represent large numbers, use one-digit scale values with the factor 10 and a positive exponent according to the number of zeros desired. If you wish to represent decimal fractions, use one-digit scale values with the factor 10 and a negative exponent according to the number of decimal places desired.

Just one further word — if you are going to use two and one-half columns of your valuable space to explain a controversial point, please clarify, not further confuse an issue.

H. A. Senior
Sandy Hook, Connecticut

Editor's Note: The primary objective of our Letters column is to stimulate an interchange of ideas on such matters as style. We certainly do not subscribe to all the opinions expressed in the column, but we feel that it is important to print ideas that CAN be challenged by an alert readership. We were glad to devote so-called "valuable space" to Mr. Tucker's letter, just as we were happy to allow the space necessary for Mr. Senior's refutation.

We earnestly solicit your use of this department to discuss matters of this type with your colleagues. Many of our readers will benefit from such an exchange.

To Editor, *STWP Review:*

Daniel Marder's article ("Rhetoric Applied to Scientific Method") in the July issue shows the benefits of keeping the experimental approach in mind when one writes a report, but it is doubtful that one ought to report the steps taken in an experiment in the order in which they were performed during the research. Mr. Marder imposes the logic of research on the logic of reporting, and reporting is thereby kept from performing its natural function.

The aim of research is to find answers to problems, and Mr. Marder has clearly outlined the steps scientists have found will lead to the most rigorous and satisfactory answers. The aim of a report, however, is primarily to tell its readers what those answers are, so the report ought to be organized to answer the reader's questions *in the order in which they are likely to be asked.* There is no compelling reason why a writer should, as Mr. Marder suggests, discuss his conclusions and recommendations last simply because they naturally came last in his research program.

Probably everyone has searched at the end of a report or article to find out first what is concluded or recommended. The reader who does this exhibits a sound instinct which the report writer cannot ignore. If the writer tries to take the reader step by step through the history of the research, then he will simply force the

reader to skip around in the report to find the parts of interest to him. Though it is true that many readers will want to see how the conclusions were arrived at, only rarely will a reader be interested first of all in the method. If we ask someone "Did the detector I gave you last month do the job?" we will become impatient if he takes us through his experimental approach before he answers the question. We of course expect him to be able to answer questions on his approach, but we first want to know what he learned from his research.

The difficulty with Mr. Marder's recommended organization is that it does not take into account the needs of the audience. The report writer will tend without prompting to write the history of his work; it is the job of the editor to remind him that the reader will have to know the essence of the research before he becomes curious about the method.

Norman T. Burns
Willow Run Laboratories
The University of Michigan
Ann Arbor, Michigan

To Editor, *STWP Review:*

Please accept my compliments for the very interesting article by J. J. Shulman in the July issue (pp. 17-21), and for the informative paper by R. G. Rice *et al.* (pp. 11-15).

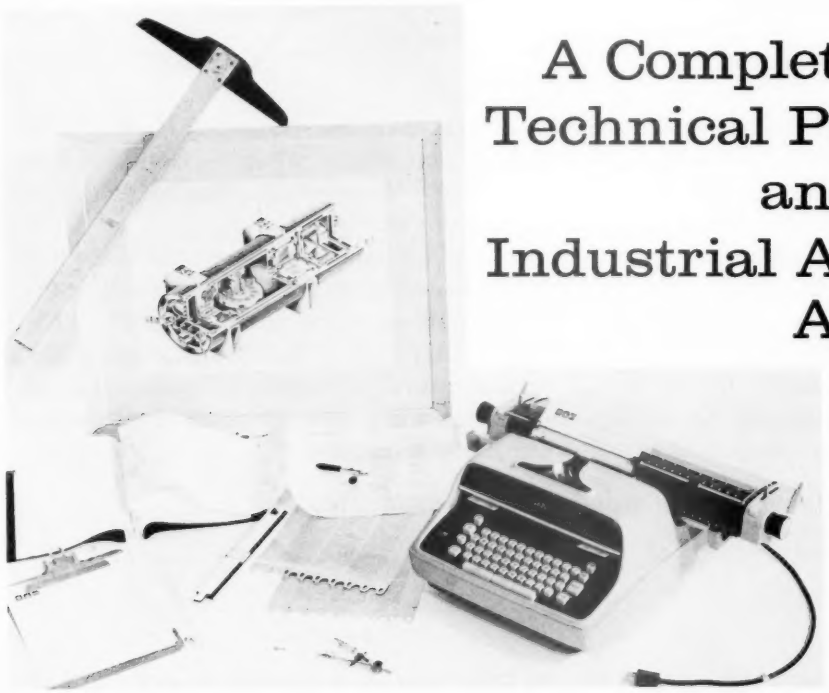
The book review by Milton H. Aronson (pp. 28-29) is a refreshing change from the customary pusillanimous reviews, which seem fearful of expressing an honest opinion, lest the reviewer step on somebody's toes. Here is a reviewer who has something to say, and says it. The *Review* might do well to publish more of Mr. Aronson's vigorous prose.

Equally refreshing are the two letters by Vernon Steensland (pp. 34-35). Mr. Steensland has a very valid point when he speaks of "distilling off the excess words" and of other editorial measures to improve the editorial in question. It is surprising again and again that a publication which represents writers, editors, and now even publishers should contain so much material which would benefit considerably from a more vigorous and liberal use of the blue pencil!

I also must agree with Mr. Steensland's view about professionalism. Many words about this subject have been published in the *Review*. Most of these articles, unfortunately, seem to forget that professionalism can be gained only by rigid self-criticism, rather than by back-patting self-admiration. Recognition that technical writing is a profession must come from the outside; it cannot be legislated. A technical writer will be recognized as a professional by his management if the quality and the results of his work merit such recognition; not because of his own statement that he is a professional. The same applies to our entire organization. We first must prove by our work, our attitude, and our ability that we are professionals. Then, and only then, recognition will be automatic.

In this connection, I often think of several courses I attended in college some decades ago. Certain professors never found it necessary to define the meaning of "science" in those courses which obviously are sciences, such as mathematics, physics, chemistry, and the like. In courses on subjects which are less obviously sciences (such as many of the social "sciences"), the first lecture always included a definition of "science," with subsequent proof that the course in question fitted this definition. Such maneuvers always are suspect and, for some strange reason, bear a close resemblance to the definitions and subsequent discussions of professionalism which have appeared in the *Review* from time to time. A concept which is self-evident requires no definition.

G. P. Schuck-Kolben
Consolidation Coal Company
Library, Pennsylvania



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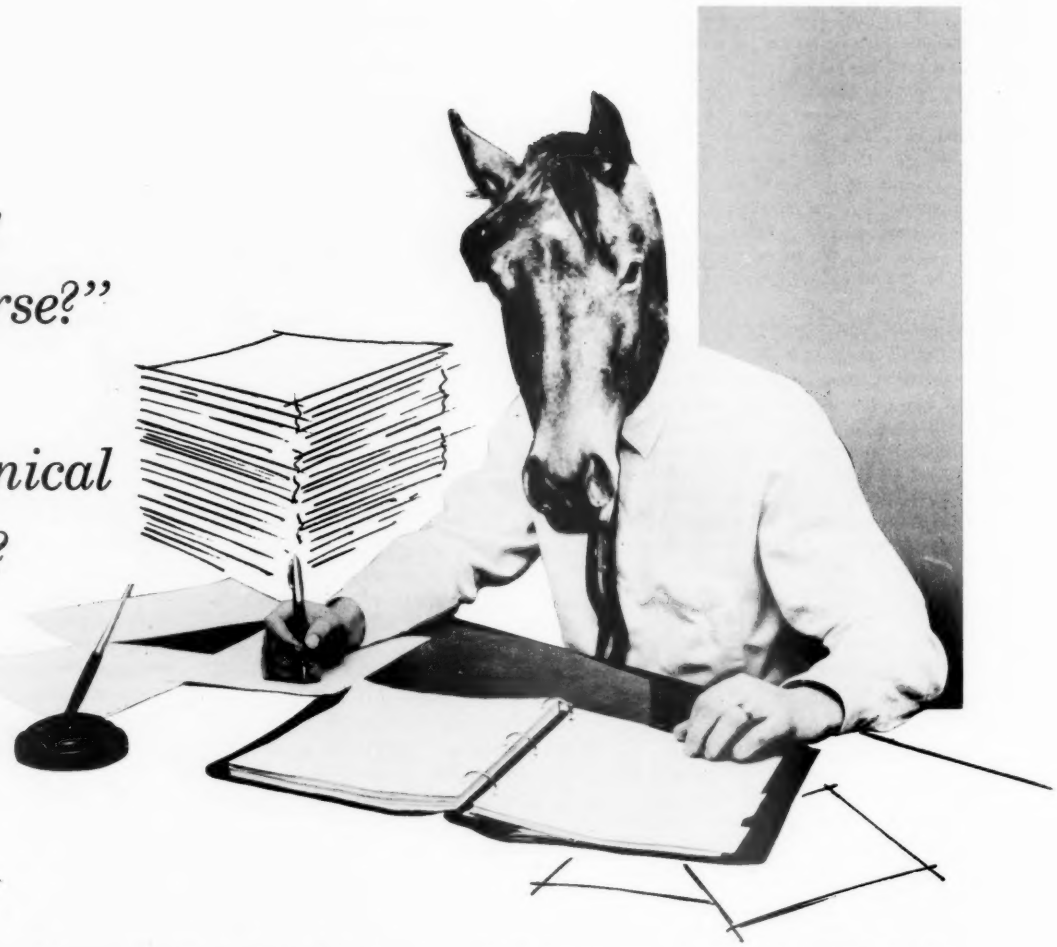

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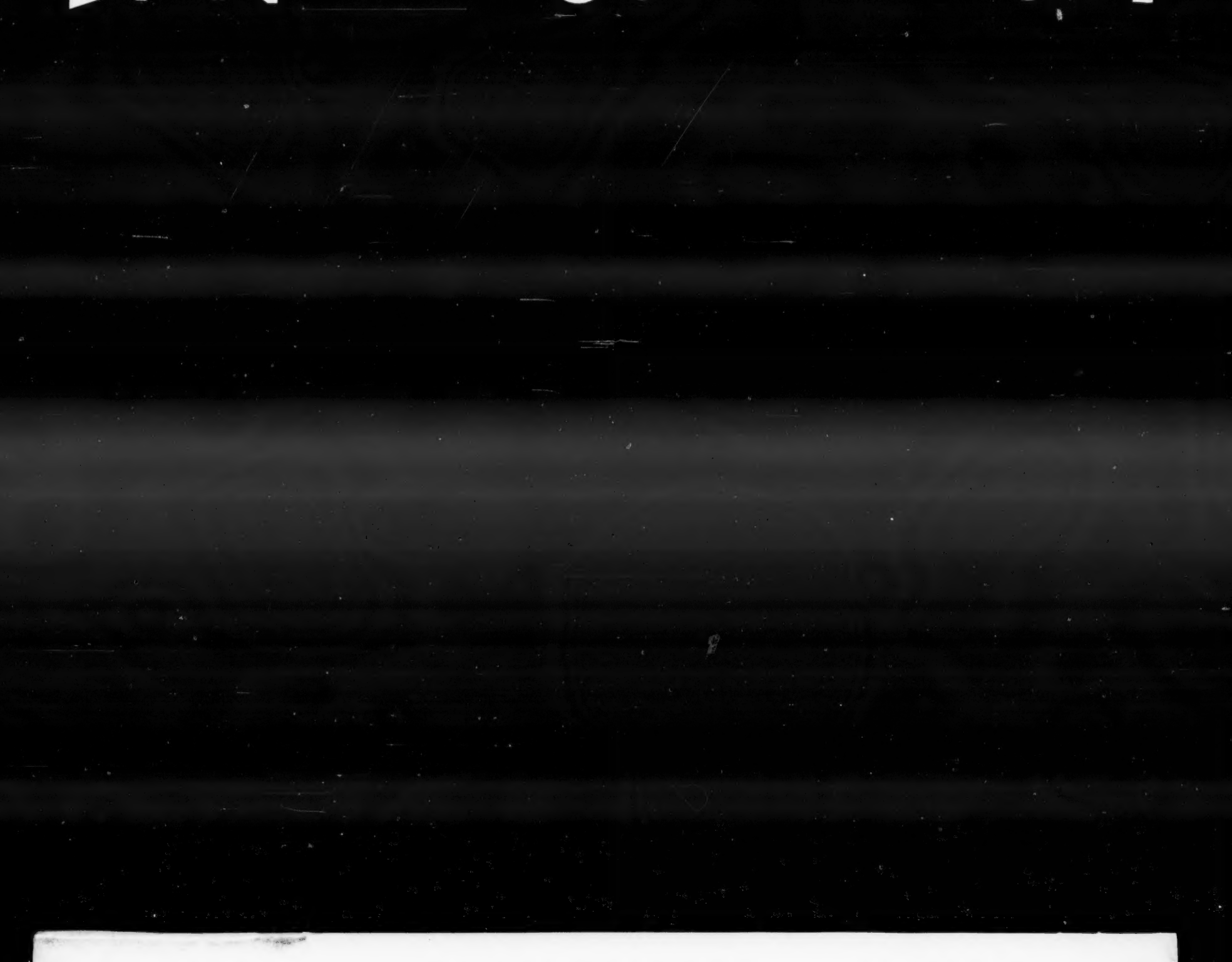
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